How Risk Modeling and Analytics Are Informing Disaster Risk Financing in Mexico

The government of Mexico developed the probabilistic catastrophe risk modelling software R-FONDEN to improve the effectiveness of Mexico's disaster risk management system. Combined with actuarial analysis of historical loss data, this tool helps inform decision making about the government's risk financing and insurance strategy, and provides risk visualization. An in-depth understanding of its risks allowed the Mexican government to develop a comprehensive financial protection strategy relying on risk retention and transfer mechanisms, including successfully accessing international reinsurance and capital markets. To identify assets exposed to natural disasters—including roads and bridges, hospitals, schools, hydraulic infrastructure, and low-income housing and the potential financial impact of their destruction, R-FONDEN was developed in three steps:

1. Data Gathering: The required database was prepared, including hazard information, an asset inventory with the key variables such as building characteristics required for evaluation of vulnerability and loss of infrastructure, and the integration of historical loss data to complement simulated data.

2. Catastrophe Risk Modeling: The government, together with the Universidad Nacional Autónoma de México (UNAM), developed hazard models for earthquakes, tropical cyclones, and floods, and vulnerability functions for all types of infrastructure. Together with the exposure database this enabled the government of Mexico to carry out deterministic and probabilistic risk modeling used to inform financial analysis of probable disaster loss.

3. Financial Analysis: Finally, the government carried out actuarial analysis of the simulated risk data and historical losses to develop and fine tune the federal disaster risk financing strategy for public infrastructure; including both risk retention and risk transfer. This also includes the development of a decision support tool to facilitate this process in the future.

As a result, R-FONDEN has informed the development of the federal disaster risk financing strategy and helped improve individual insurance policies for federal agencies. For instance, it enabled the design of an insurance program for the Ministry of Transport in charge of federal roads and bridges, a scheme that previously was difficult to insure due to insufficient asset information.